Written Homework

Your carefully written solutions to the following questions will be due at the beginning of class on **Monday, March 2**.

1. A 40-meter-long cable hangs over the edge of a very high cliff. The cable has a total mass of 30 kg and has a uniform density. How much work is required to pull the entire cable up to the top of the cliff?

2. A movable electrically charged object is repelled by a stationary charged object. The force of the repulsion is inversely proportional to the square of the distance between the objects. When the movable object is 1 cm away, the force of repulsion is 4 Newtons. Determine how much work is required to move the object to a distance of only 0.4 cm. Give your answer in Joules.

3. Find the coordinates of the centroid of the region bounded between the curves $y = 2x^2 - x + 1$ and $y = x^2 + 13$.

4. A thin metal plate occupies the region bounded by the curves $y = \sin(x)$, $y = -\sin(x)$ and to the right of $x = 0$ (as shown in the figure below). The mass density of the plate is $3 \frac{g}{cm^2}$. Find the moments about the coordinate axes for the plate. *Do not try to compute the mass of the plate.*

5. Calculate each of the following limits using L’Hospital’s Rule. Show all your work.
   (a) $\lim_{\theta \to 0} \frac{\sin \theta}{\theta}$
   (b) $\lim_{x \to \infty} \frac{e^x}{x^3}$
   (c) $\lim_{x \to 1} \frac{x^2 - x^3}{\ln x}$